Process and Tools for Mitigating Risks to Improve Maturity Level of CMM and Migrate to CMMI

Simon Milman, LUXOFT/IBS (9b Dmitrovskoye shosse, 101511 Moscow, Russia. Phone 7(095) 967-8030. SMilman@luxoft.com)

Jacques Joubert, ALSTOM Transport (23-25, avenue Morane Saulnier 92364 Meudon-la-Foret Cedex, France. Phone 33 1 46 29 16 51. jacques.joubert@transport.alstom.com)

LUXOFT
Member of the IBS Group

Topics

- Luxoft Overview
- CMMI implementation. Problem statement
- Proposed solution
- Tool description
- View of Appraiser

LUXOFT Overview

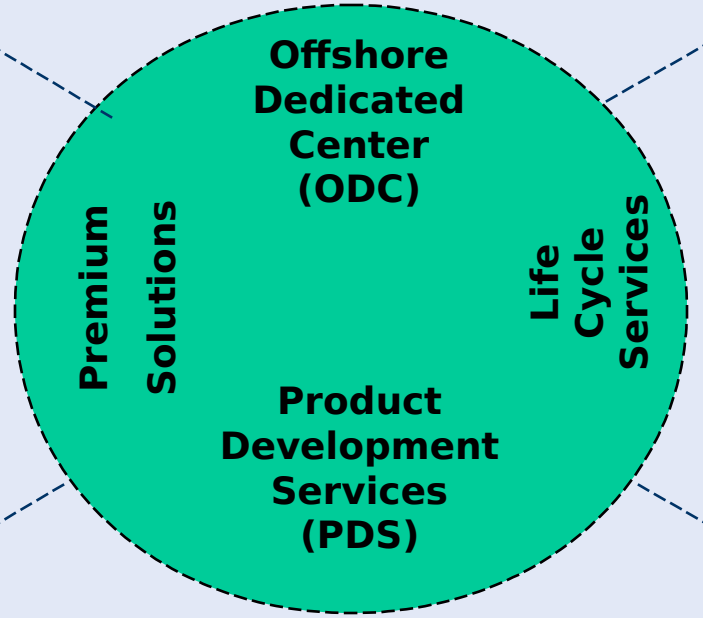
LUXOFT: Services

Seamless Integration with Customer

Effective knowledge transfer

Dedicated, Secure, Cost Effective Development Center

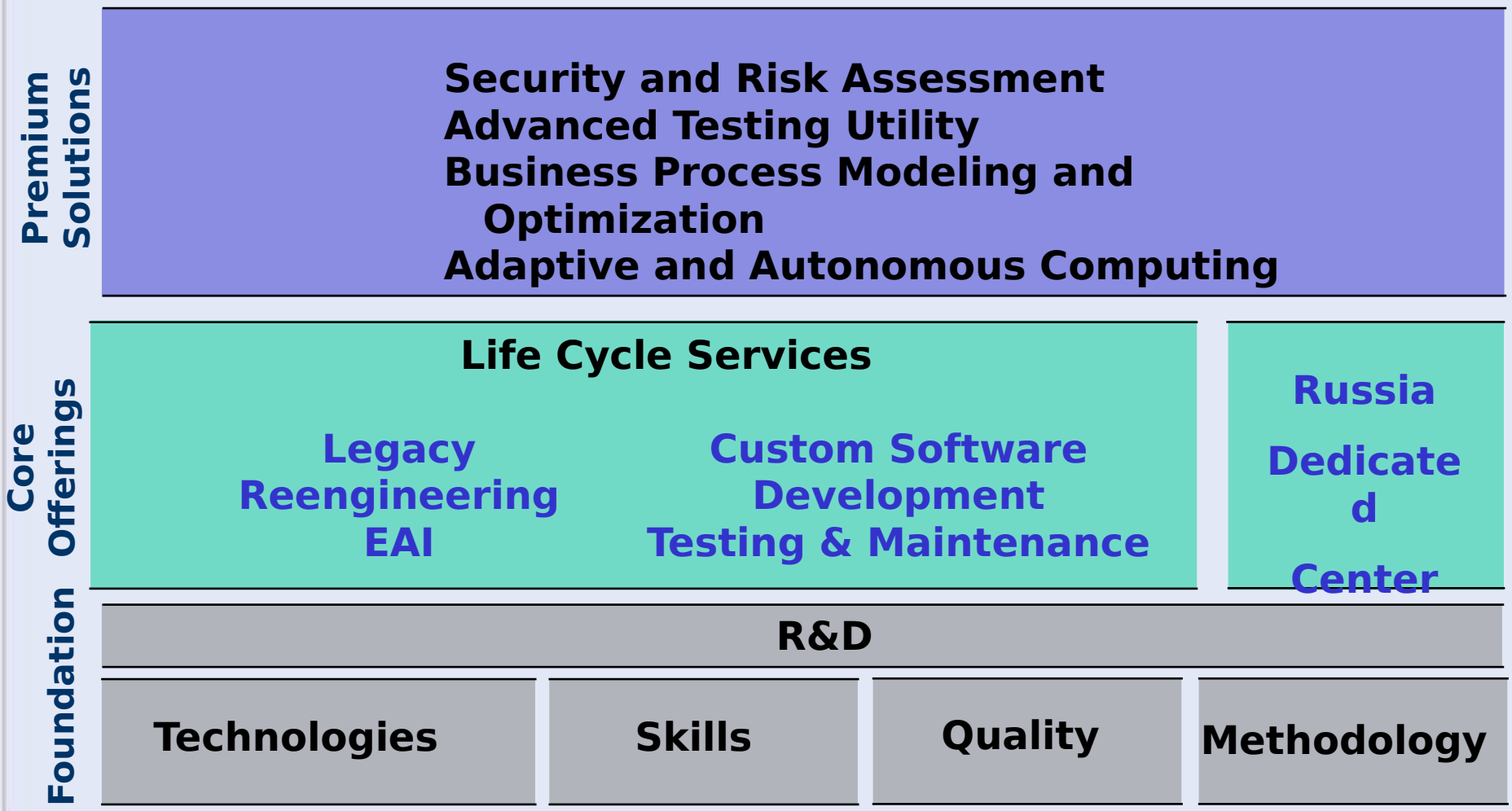
- Security and Risk Assessment Solutions
- Advanced Testing Utility
- Business Process Modeling and Optimization Solutions
- Adaptive and Autonomous Computing Solutions



- Requirements Analysis & Consulting
- New Applications Development
- Enterprise Application Integration Services
- Reengineering and Customization Services
- Maintenance
- Testing

Co-development of licensable software products and solutions

Luxoft Services Architecture



Luxoft Servi re

Dedicated Development Centers created, staffed and operated by Luxoft for Individual Customers to serve as a seamless extension of their IT/Development staff; With the objective of:

- **Allow Customers to focus on core competencies**
- **Manage Cost**
- **Provide access to specialized skills**

Premium Solutions

Security and
Advanced Te
Business Pro
Adaptive and

Core Offerings

Life Cycle Services

Legacy Reengineering
EAI

Custom Software
Development
Testing & Maintenance

Russia

Dedicate d

Center

Foundation

R&D

Technologies | Skills | Quality | Methodology

Luxoft Services Ar

Premium Solutions

Security and Risk Assessme
Advanced Testing Utility
Business Process Modeling
Adaptive and Autonomous

Core Offerings

Life Cycle Services

Legacy Reengineering
EAI

Custom Software Development
Testing & Maintenance

Custom Application Development outsourcing services covering entire life-cycle:

- **Requirements Analysis & Consulting**
- **Design & Prototyping**
- **Coding and Testing**
- **Implementation**

Performed On-shore & Off-shore

Russia
Dedicated Development Center

Foundation

R&D

Technologies | Skills | Quality | Methodology

LUXOFT: Technical Expertise

Platforms

- Windows / Windows CE
- Unix
- AS/400
- Mainframes

Languages

- C / C++ / C#
- Java
- Visual Basic
- COBOL

Databases

- Oracle
- MS SQL Server
- Sybase
- IBM DB2
- Informix

Technologies

- J2EE
- Windows DNA / .NET
- HTML / DHTML / XHTML
- SGML / XML / XSL and PDF
- CORBA

Application Servers

- BEA Weblogic
- IBM Websphere
- Webmethods
- Microsoft BizTalk

and more...

CMMI Implementation Problem Statement

Understanding CMMI

- The model description is large and rather complex
- How to get structured view on the framework, how to navigate model easily?
- How to make this description easier for understanding by employees?
- How to apply CMM/CMMI most efficiently?

Labor-Intensiveness

- Mapping company's processes and artifacts to CMM key practices and CMMI PAs and TWPs is labor intensive
- Conducting internal process assessments is labor-intensive – hundreds of documents should be evaluated, results should be carefully analyzed
- Internal assessments may be conducted usually not more than once-twice a year
- Significant human resources involved into CMM/CMMI appraisal
- CMMI appraisal usually requires long time

CMMI Implementation Risks

- The mapping results are not correct
- Interpretation of Typical Work Products (TWPs) is simplified or not objective
- Key experts leave CMMI implementation project before the project completion
- Implementation results are not the ones you were expecting

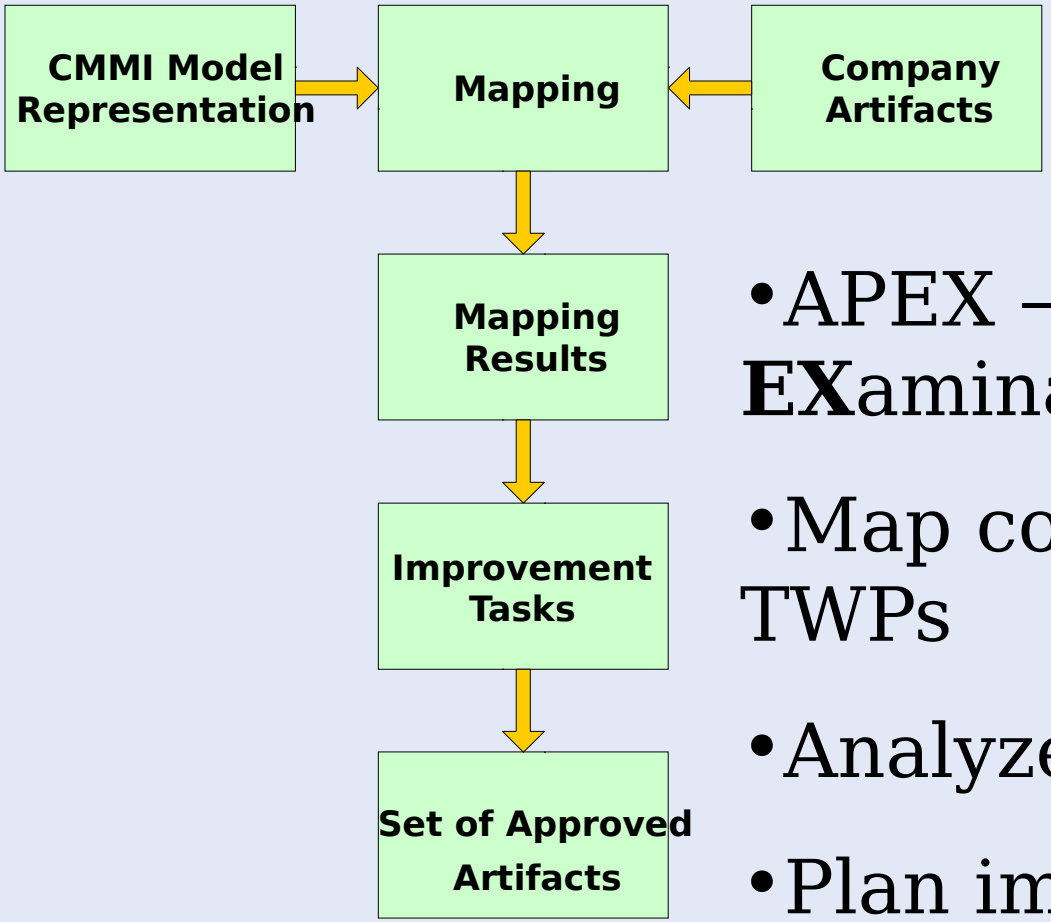
IMPACT – Fruitful features of the model are obscured and significant benefits are lost

Proposed Solution

Our Approach

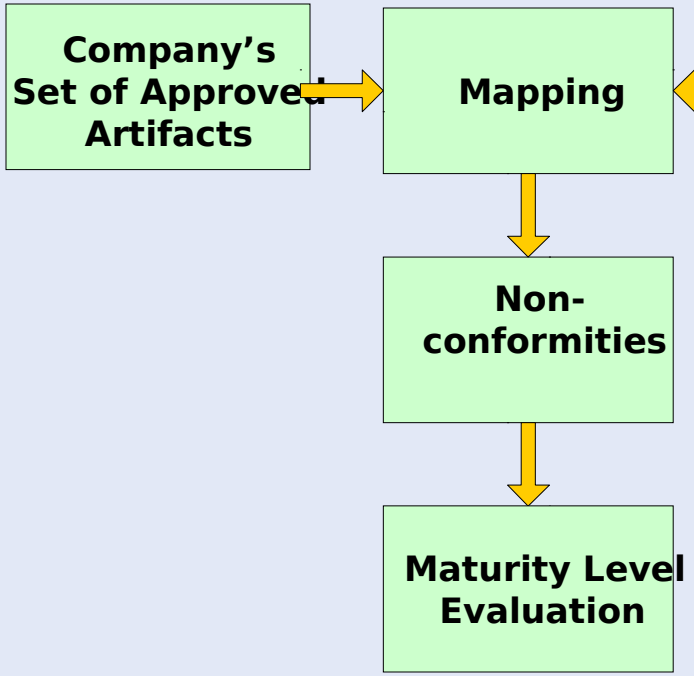
- To be based on PII matrices technology
- To define the structure and content of each required artifact to be compliant with CMMI (approved set of artifacts).
- To improve or refine processes
- To pilot these processes and develop typical project artifacts
- To compose projects' PII matrices
- Perform continuous internal mini-assessments (project QA audits) and to map real project's artifacts on approved set of artifacts

APEX Tool Concept



- APEX – **AP**praisal **EX**amination
- Map company's artifacts to TWPs
- Analyze non-conformities
- Plan improvement

Internal Mini-Assessment Concept



- Map project's artifacts to set of approved artifacts
- Analyze discrepancies
- Evaluate maturity level

APEX Tool -Functional Overview

- Provides structured representation of CMMI model
- Allows adding comments to model elements
- Supports describing company's and project's set of artifacts
- Contains the shortcut to each artifact
- Documents the results of mapping between company artifacts and TWPs
- Allows defining degree of company's processes and artifacts compliance with model

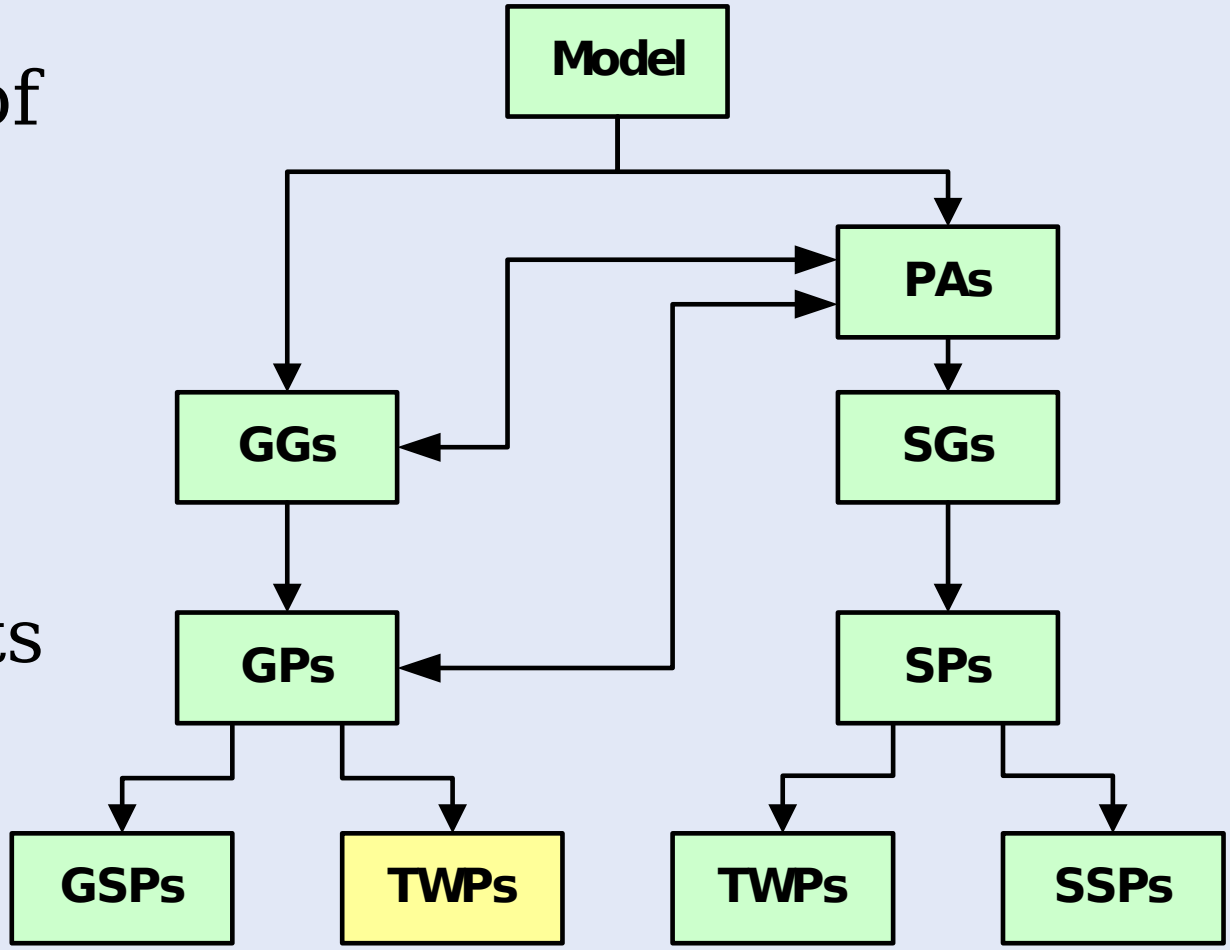
Functional Overview #2

- Contains information about all projects
- Generates variety of reports, including PII matrices
- Stores appraisal results
- Allows to record tasks
- Allows to document the results of monitoring

APEX Tool Description

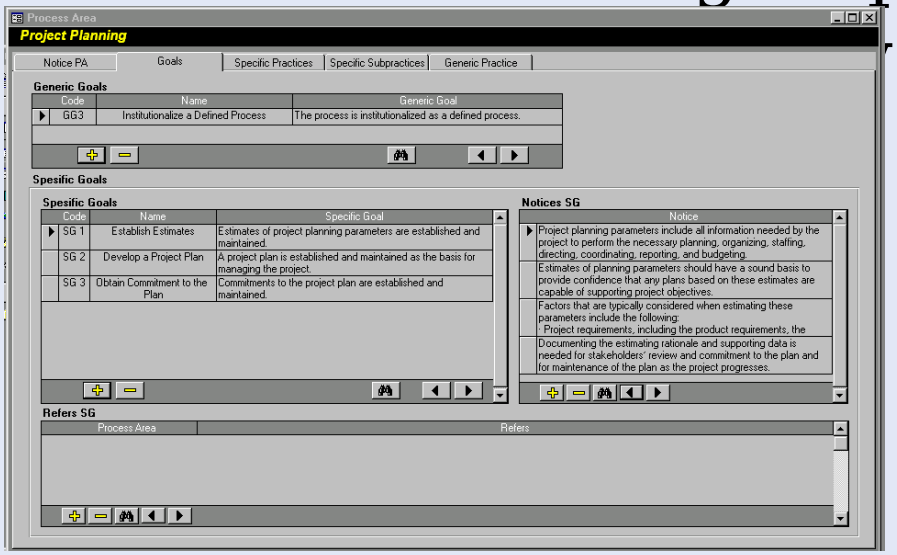
CMMI Model Representation

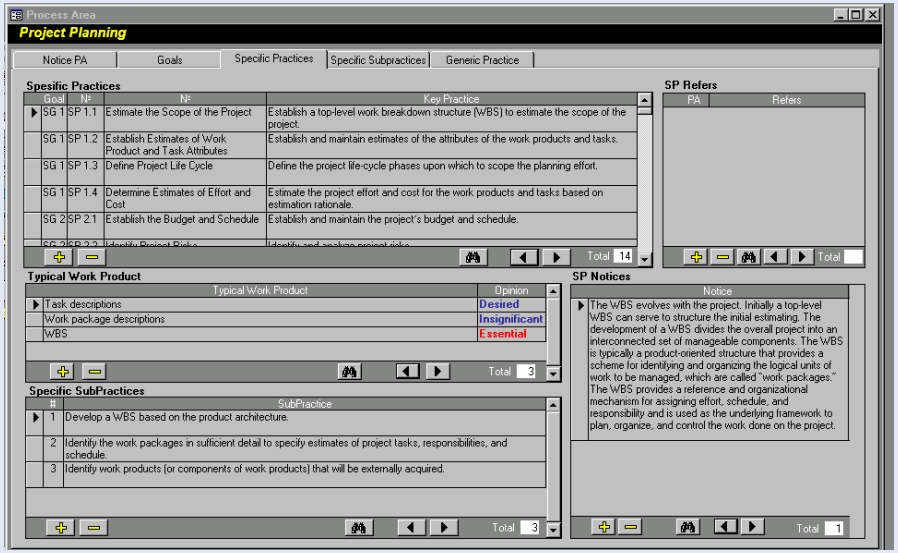
- Description of each model element is contained in the tool
- You may add your comments to each element
- **TWPs for GPs are added**



CMMI Model Navigation

- Model navigation is based on three views: Process Areas view, Generic Goals and Practices view, and Specific Goals and Practices view
- It makes finding required model element

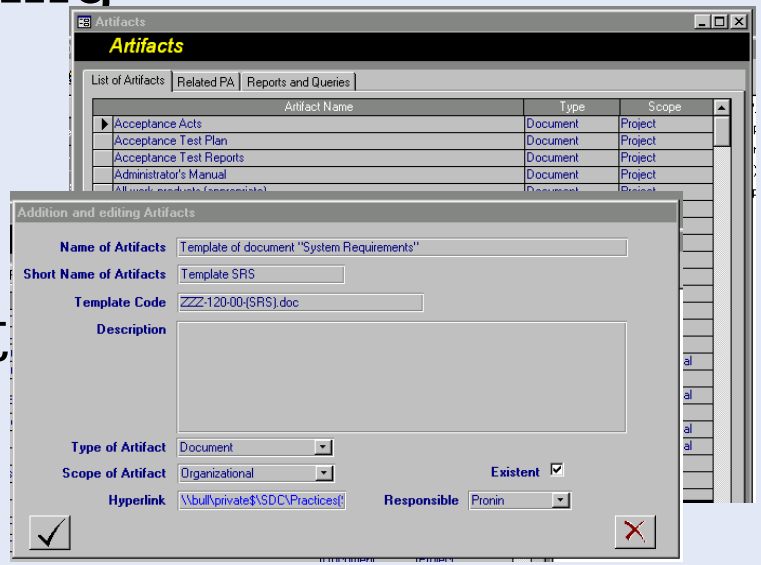

Process Area
Project Planning
Notice PA
Goals
Specific Practices
Specific Subpractices
Generic Practice
Generic Goals
Code
Name
Generic Goal
GG3
Institutionalize a Defined Process
The process is institutionalized as a defined process.
Spesific Goals
Spesific Goals
Code
Name
Specific Goal
SG 1
Establish Estimates
Estimates of project planning parameters are established and maintained.
SG 2
Develop a Project Plan
A project plan is established and maintained as the basis for managing the project.
SG 3
Obtain Commitment to the Plan
Commitments to the project plan are established and maintained.
Notices SG
Notice
Project planning parameters include all information needed by the project to perform the necessary planning, organizing, staffing, directing, coordinating, reporting, and budgeting.
Estimates of planning parameters should have a sound basis to provide confidence that any plans based on these estimates are capable of supporting project objectives.
Factors that are typically considered when estimating these parameters include the following:
· Project requirements, including the product requirements, the
Documenting the estimating rationale and supporting data is needed for stakeholders' review and commitment to the plan and for maintenance of the plan as the project progresses.
Refers SG
Process Area
Refers


Process Area
Project Planning
Notice PA
Goals
Specific Practices
Specific Subpractices
Generic Practice
Spesific Practices
Goal
№
№
Key Practice
SG 1
SP 1.1
Estimate the Scope of the Project
Establish a top-level work breakdown structure (WBS) to estimate the scope of the project.
SG 1
SP 1.2
Establish Estimates of Work Product and Task Attributes
Establish and maintain estimates of the attributes of the work products and tasks.
SG 1
SP 1.3
Define Project Life Cycle
Define the project life-cycle phases upon which to scope the planning effort.
SG 1
SP 1.4
Determine Estimates of Effort and Cost
Estimate the project effort and cost for the work products and tasks based on estimation rationale.
SG 2
SP 2.1
Establish the Budget and Schedule
Establish and maintain the project's budget and schedule.
Total 14
SP Refers
PA
Refers
Typical Work Product
Typical Work Product
Opinion
Task descriptions
Desired
Work package descriptions
Insignificant
WBS
Essential
Total 3
SP Notices
Notice
The WBS evolves with the project. Initially a top-level WBS can serve to structure the initial estimating. The development of a WBS divides the overall project into an interconnected set of manageable components. The WBS is typically a product-oriented structure that provides a scheme for identifying and organizing the logical units of work to be managed, which are called "work packages." The WBS provides a reference and organizational mechanism for assigning effort, schedule, and responsibility and is used as the underlying framework to plan, organize, and control the work done on the project.
Total 1
Specific SubPractices
#
SubPractice
1
Develop a WBS based on the product architecture.
2
Identify the work packages in sufficient detail to specify estimates of project tasks, responsibilities, and schedule.
3
Identify work products (or components of work products) that will be externally acquired.
Total 3

Artifact Description

Database contains the following description of each artifact:

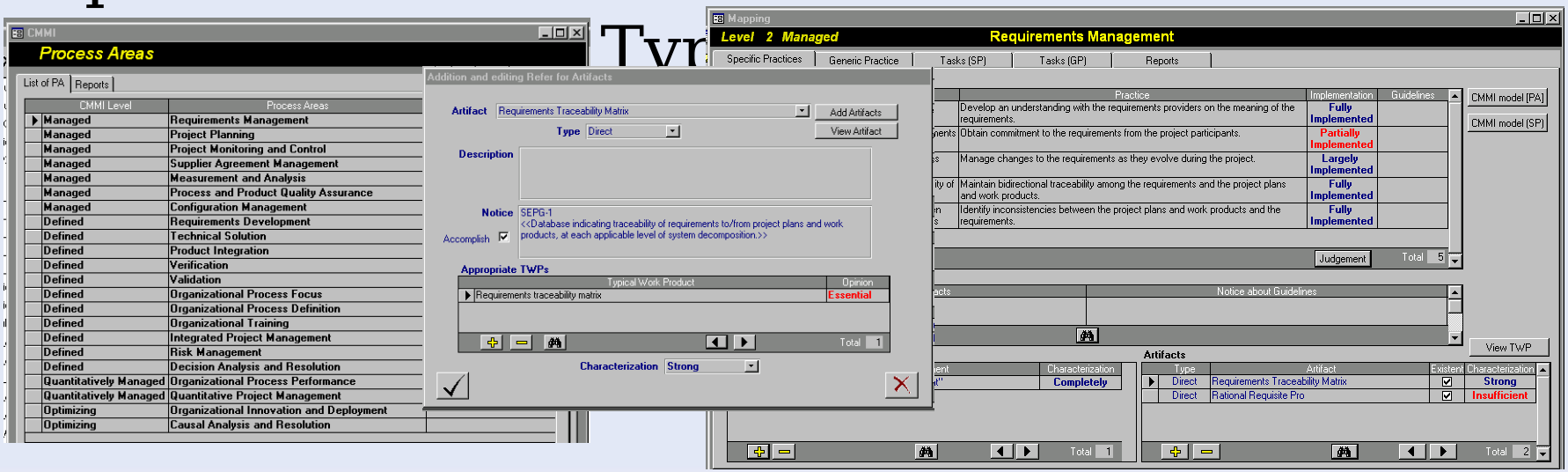
- Name
- Template code
- Free text information on art
- Type (document/software tool/procedure/equipment)
- Whether it is organizational or project level
- Location
- Responsible person (owner)



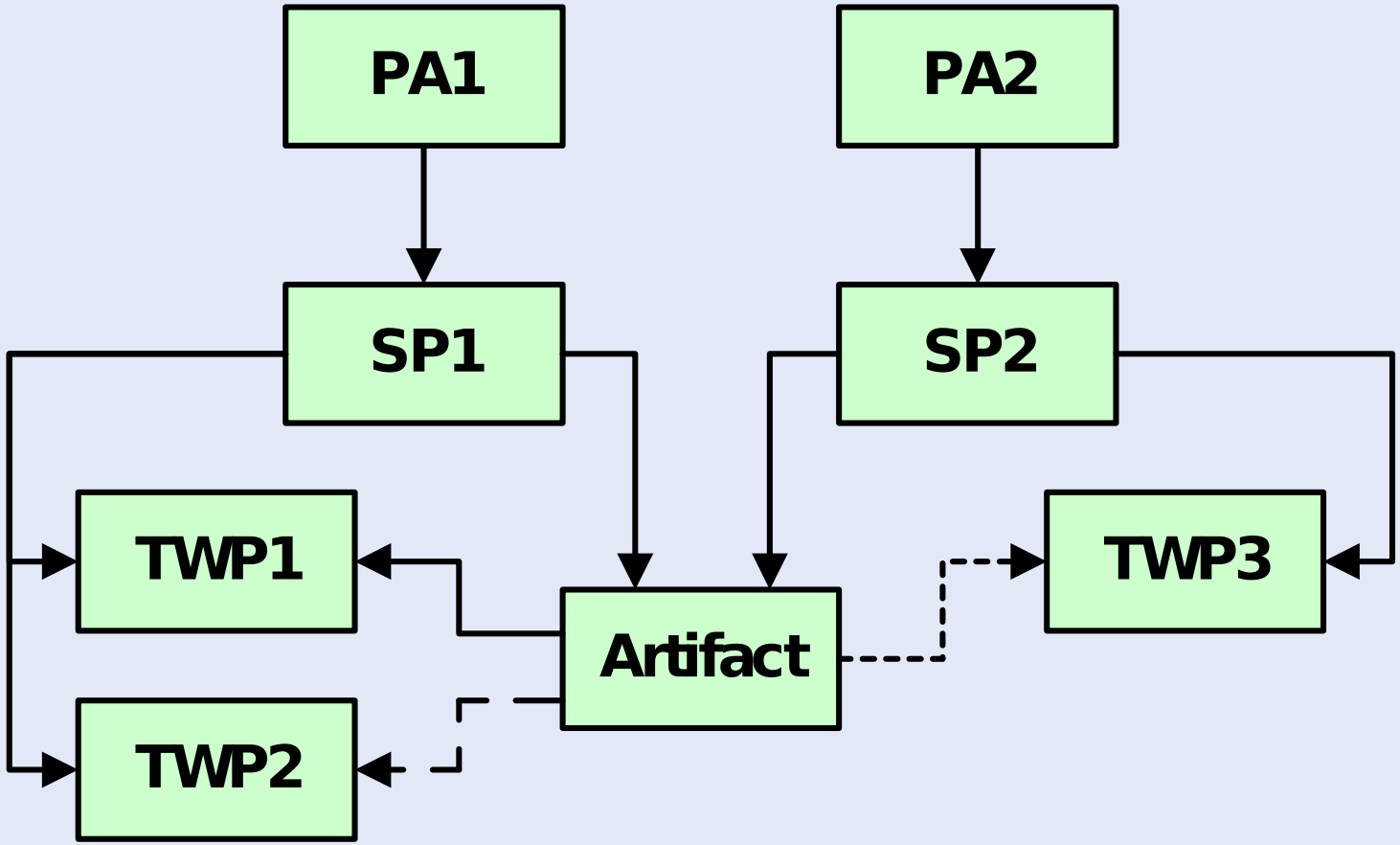
Defining Mapping

To do mapping using APEX Tool you should:

- Select Process Area
- Select relevant Generic or Specific Practice
- Add or edit artifacts related to selected practice



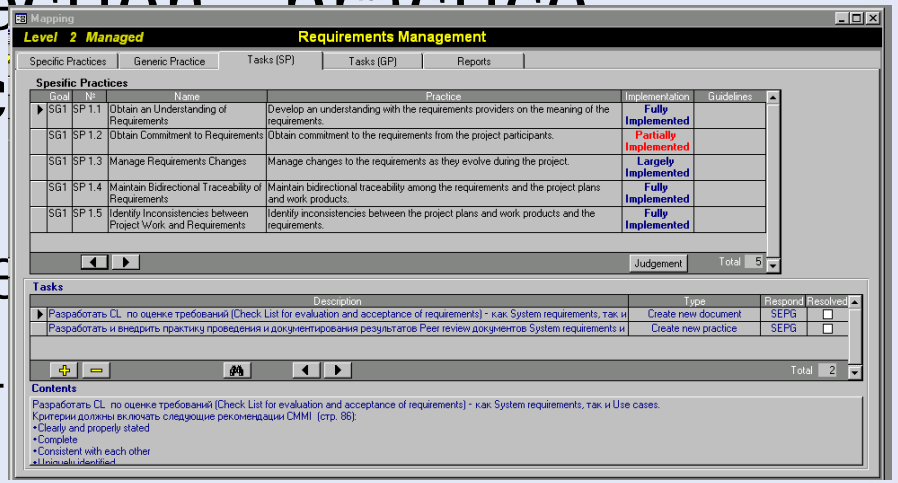
Defining Mapping #2



Analyzing Mapping Results

- Mapping results are the basis for improvement tasks
- Each task is related to specific GP or SP. For each task the following is specified:

- Task description and type (check, document creation/correction, practice creation/correction, disc
- Responsible person
- Degree of accomplishme
- List of related tasks and


Mapping
Level 2 Managed
Requirements Management
Specific Practices
Generic Practice
Tasks (SP)
Tasks (GP)
Reports
Spesific Practices
Goal
№
Name
Practice
Implementation
Guidelines
SG1 SP 1.1 Obtain an Understanding of Requirements
Develop an understanding with the requirements providers on the meaning of the requirements.
Fully Implemented
SG1 SP 1.2 Obtain Commitment to Requirements
Obtain commitment to the requirements from the project participants.
Partially Implemented
SG1 SP 1.3 Manage Requirements Changes
Manage changes to the requirements as they evolve during the project.
Largely Implemented
SG1 SP 1.4 Maintain Bidirectional Traceability of Requirements
Maintain bidirectional traceability among the requirements and the project plans and work products.
Fully Implemented
SG1 SP 1.5 Identify Inconsistencies between Project Work and Requirements
Identify inconsistencies between the project plans and work products and the requirements.
Fully Implemented
Judgement
Total 5
Tasks
Description
Type
Respond
Resolved
Разработать CL по оценке требований (Check List for evaluation and acceptance of requirements) - как System requirements, так и
Create new document
SEPG
Разработать и внедрить практику проведения и документирования результатов Peer review документов System requirements и
Create new practice
SEPG
Total 2
Contents
Разработать CL по оценке требований (Check List for evaluation and acceptance of requirements) - как System requirements, так и Use cases.
Критерии должны включать следующие рекомендации CMMI (стр. 86):
•Clearly and properly stated
•Complete
•Consistent with each other

Set of Approved Artifacts

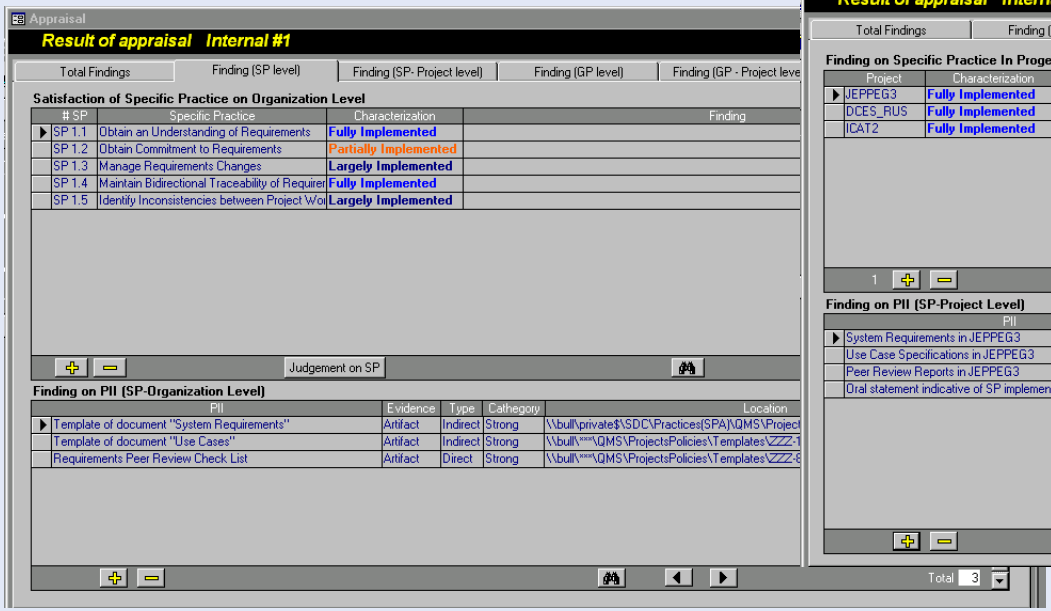
As a result of improvements, set of artifacts compliant with CMMI model is developed and approved internally .

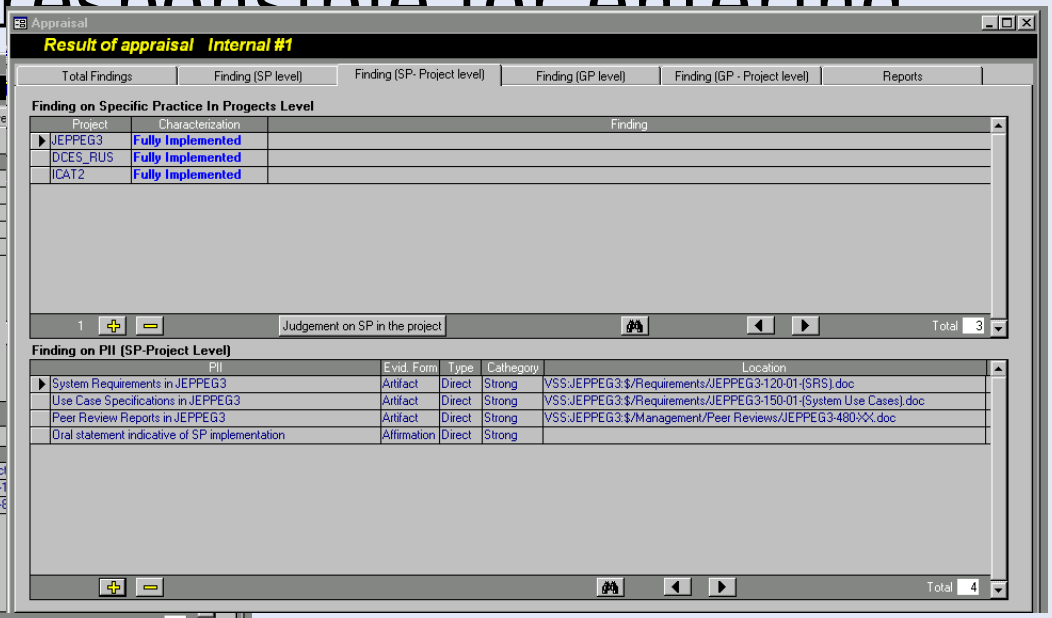
This set of artifacts is used as a reference for conducting internal project assessments.

Because all required data are stored in the APEX database, assessment productivity significantly increases.

Mini-Assessment Support #1

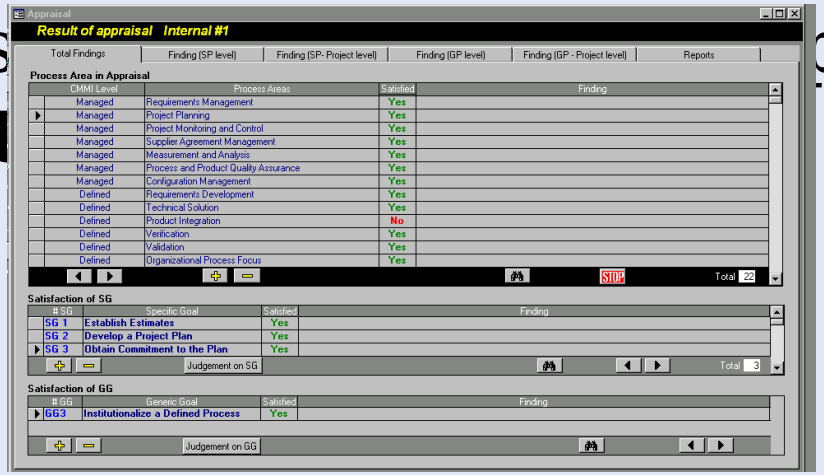
- APEX provides functionality for defining mini-assessments and documenting assessment results.
- Internal Assessor is responsible for entering


Appraisal
Result of appraisal Internal #1
Total Findings
Finding (SP level)
Finding (SP- Project level)
Finding (GP level)
Finding (GP - Project leve
Satisfaction of Specific Practice on Organization Level
SP
Specific Practice
Characterization
Finding
SP 1.1 Obtain an Understanding of Requirements Fully Implemented
SP 1.2 Obtain Commitment to Requirements Partially Implemented
SP 1.3 Manage Requirements Changes Largely Implemented
SP 1.4 Maintain Bidirectional Traceability of Requirer Fully Implemented
SP 1.5 Identify Inconsistencies between Project Wor Largely Implemented
Judgement on SP
Finding on PII (SP-Organization Level)
PII
Evidence
Type
Cathegory
Location
Template of document "System Requirements" Artifact Indirect Strong \\bull\private$\SDC\Practices(SPA)\QMS\Project
Template of document "Use Cases" Artifact Indirect Strong \\bull****\QMS\ProjectsPolicies\Templates\ZZZ-
Requirements Peer Review Check List Artifact Direct Strong \\bull****\QMS\ProjectsPolicies\Templates\ZZZ-
Total 3



Mini-Assessment Support#2

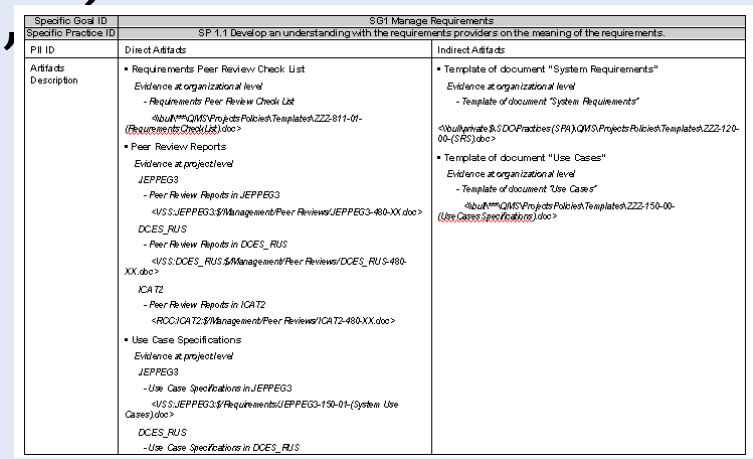
- APEX allows to document findings on several levels: GG and SG level, GP and SP, and on project level.
- Each mini-assessment has its own scope (set of projects, CMMI model coverage, etc.).
- By increasing productivity of internal mini-assessments **perform such assessment**



APEX Reporting Capabilities

The APEX may generate a large number of reports, including:

- Reports on Practices coverage by artifacts
- Reports on improvement plan implementation
- Reports on mini-assessment findings
- Description of PAs, GGs, SGs, GPs and SPs
- Organization's and Project'



Specific Goal ID	SG1 Manage Requirements	
Specific Practice ID	SP 1.1 Develop an understanding with the requirements providers on the meaning of the requirements.	
PII ID	Direct Artifacts	Indirect Artifacts
Artifacts Description	• Requirements Peer Review Check List *Evidence at organizational level* *- Requirements Peer Review Check List* <\bull***\QMS\Projects Policies\Templates\ZZZ-811-01-(Requirements Check List).doc> • Peer Review Reports *Evidence at project level* *JEPPEG3* *- Peer Review Reports in JEPPEG3* <\/SS:JEPPEG3:$/Management/Peer Reviews/JEPPEG3-480-XX.doc> *DCES_RUS* *- Peer Review Reports in DCES_RUS* <\/SS:DCES_RUS:$/Management/Peer Reviews/DCES_RUS-480-XX.doc> *ICAT2* *- Peer Review Reports in ICAT2* <RCC:ICAT2:$/Management/Peer Reviews/ICAT2-480-XX.doc> • Use Case Specifications *Evidence at project level* *JEPPEG3* *- Use Case Specifications in JEPPEG3* <\/SS:JEPPEG3:$/Requirements/JEPPEG3-150-01-(System Use Cases).doc> *DCES_RUS* *- Use Case Specifications in DCES_RUS*	• Template of document "System Requirements" *Evidence at organizational level* *- Template of document "System Requirements"* <\bull\private$\SDO\Practices (SPA)\QMS\Projects Policies\Templates\ZZZ-120-00-(SRS).doc> • Template of document "Use Cases" *Evidence at organizational level* *- Template of document "Use Cases"* <\bull***\QMS\Projects Policies\Templates\ZZZ-150-00-(Use Cases Specifications).doc>

View of Appraiser

Advantages #1

- APEX emphasizes the main advantages of SCAMPI process which are: accuracy, reliability and repeatability of results
- PII matrices may be prepared in advance, it gives to appraiser opportunities to investigate evidences before on site appraisal and take GO/NO GO decision to perform the official SCAMPI.

Advantages #2

- All artifacts are available directly via APEX, which makes it much simpler to find and examine artifacts during mini appraisal & SCAMPI
- The documenting of appraisal's results requires significantly less time and more objective
- All assessment team members can investigate simultaneously different artifacts in the same network

Advantages #3

- Much simpler to interview – participants of interview have opportunity to demonstrate required artifacts via APEX.
- APEX significantly facilitates corrections in PII matrices resulted from assessment team consensus.
- The time to implement CMMI or to migrate from CMM to CMMI is significantly decreased.
- **Time for on site SCAMPI (5 levels) may be decreased from 20 days to 8**

Mapping Artifacts to Practices

Artifact relation to practice is described as follows:

- Does artifact directly or indirectly implements practice?
- Which TWPs are related to artifact?
- Degree of practice implementation in accordance with SCAMPI (Fully Implemented, Largely Implemented, Partially Implemented, Not Implemented)

Risk Mitigation

- PII matrices generated by APEX provide immediate information on current process maturity
- LUXOFT approach mitigated risks related to understanding, interpretation, and inter-relations of CMM and CMMI practices
- Knowledge base is maintained and accessible to all interested parties even if key participants are not available
- APEX mitigates the risk of different interpretation of model by external and

Your questions/comments?